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EXAMINER	
PANWALKAR, VINEETA S	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/681,687	**Applicant(s)** BETTS, WILLIAM L.	
	Examiner VINEETA S. PANWALKAR	**Art Unit** 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *12,13 and 15* is/are allowed.

6)☒ Claim(s) *1-11,14 and 16-20* is/are rejected.

7)☒ Claim(s) *21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/21/09 has been entered.

Response to Arguments

2. Applicant's arguments filed 1/21/09 have been fully considered but they are not persuasive.

2a. Regarding 1, 10 and 16, applicant argues that previously cited prior art Friedman et al. (US 5983388) fails to disclose “combining” a time series into a block of N output symbols, as claimed. As an example, applicant cites of symbol output on line 311 of Fig. 3 of instant application is a “combination” of symbols 306-309. However, it is pointed out that while claims are read in light of the specification, the specification is not read into the claims. The claims are given the broadest possible reasonable interpretation. The word “combine” is defined as “to bring into or join in a close union or whole”. Thus, output of any interleaver is a union (i.e. combination) of its inputs. Please refer to Kaneko (US 3697874) and Cohen et al. (US 3749841) for further support. Kaneko and Cohen et al, disclose combining data by interleaving.

Please refer to the applicant's representation of Friedman's Fig. 1 on page 3 of the remarks filed 1/21/09. Time series A B C is output by interleaver 1 as B C A, for example, i.e. a "combination" or union of each of the input symbols in the time series. Further, the outputs of all 3 interleavers in response to time series A B C is a block of three interleaver outputs, each comprising a combination of each of the input symbols A B C. Thus, contrary to applicant's arguments, Friedman does disclose "combining" as claimed.

2b. Applicant further argues that Friedman is a multiuser system and teaches that each independent stream may have a different rate that is adjusted to each user's individual needs and hence teaches away from having the streams identical. However, it is pointed out that Friedman was relied upon for its admitted prior art and hence does not teach away from the data streams being identical. In fact, Friedman teaches that for the system of Fig. 1, additional problem arises in multiuser systems due to need for individual data rate adjustments (See Column 1, lines 25-50). Thus, if the same data rate and data is desired by each user of Friedman's system of Fig 1 is capable of operating without problems in a fashion as explained in the previous office action. Hence contrary to applicant's argument, Friedman does not teach away from the claim.

2c. Applicant also argues that it is incorrect to group the symbols at the output of each interleaver and refer to the symbols collectively as "output symbol".

However, it is pointed out that instant application shows no criticality regarding symbol size/grouping. Again, while the claim is read in light of the specification, the specification is not read into the claims. The claims are given the broadest possible reasonable interpretation. Giving the claim its broadest reasonable interpretation, the term “output symbol” becomes a question of naming convention. Applicant is referred to Column 11, lines 26-35 of Chouly et al. (US 5416801). Chouly states that 900 QPSK symbols are grouped to correspond to one OFDM symbol. Similarly, for Friedman, the interleaved output comprising a combination of input symbols may be referred to as an “output symbol”. Although Friedman does not explicitly refer to such a grouping or use such a naming convention, the interleaved symbols of Friedman are further operated upon as a group. There is no evidence of separating the “output symbol” of each interleaver. Each “output symbol” is further passed on to an encoder and then transmitted as a whole (i.e. without being split into further parts). Interpreting the output of each interleaver to be an “output symbol” does not affect the outcome. Therefore interpreting the output of each interleaver for a given time series input as an “output symbol” is reasonable. Hence, the interpretation is maintained.

2d. In light of the terminal disclaimer filed 1/21/09 (approved 3/16/09), the double patenting rejection made in previous office action is withdrawn.

2g. Claims 12-15 invoke 35 U.S.C. 112, sixth paragraph (An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof). Hence, hereinafter, claims shall be construed to cover the corresponding structure described in the specification and equivalents thereof. Therefore previously made rejections of claims 12-15 under 35 U.S.C. 103(a) are hereinafter withdrawn.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 8 and 14 are rejected under 35 U.S.C. 112, second paragraph, because it appears from the specification as if the output of the “fourth logic block” of claim 2 or the output of the “means for combining the block of output symbols” is re-interleaved, rather than the “block of output symbols” itself as claimed. Clarification is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5, 9-11, 16-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friedman et al. (US 5983388), hereinafter, Friedman, in view of Fukumasa et al. (US 6018545), hereinafter, Fukumasa.

3a. Regarding claims 1, 10 and 16, Friedman discloses a communication system and (corresponding method and means as per claims 10 and 12. As per claim 16, "program embodied in a computer-readable storage medium" in the preamble does not breathe life into the claim, and has not been given patentable weight) (Fig. 1) comprising:

- first logic (Column 1, lines 26-38 and Fig. 1 interleavers 104_1- 104_3 are together equivalent to claimed first logic) configured to combine a time series of N input symbols (Column 1, lines 26-38. Time series 102_1 - 102_3 are input to interleavers 104_1 - 104_3. Inherently, data series 102_1 - 102_3 comprise symbols. Thus, each data series 102_1 - 102_3, each comprising N=3 symbols with each series being exactly identical, is interpreted as claimed time series) into a block of output symbols (Column 1, lines 26-38. Outputs of interleavers 104_1- 104_3 together form a block, wherein output of each individual interleaver is equivalent to one of the claimed output symbols), wherein N is greater than one (N is chosen to be 3 for the 3 interleavers 104_1- 104_3), wherein the block comprises N output symbols (Column 1, lines 26-38. Outputs of interleavers 104_1- 104_3 together form a block, wherein output of each individual interleaver is equivalent to one of the claimed output symbols, thereby resulting in 3 output symbols), wherein each of the output symbols comprises a combination of the N input symbols (Column 1, lines 26-38. Each of the interleavers 104_1 - 104_3 inherently outputs a symbol comprising a combination of its N input symbols. Thus, for identical data input series 102_1 - 102_3 with size N=3, the outputs of the 3 interleavers would result in a block of 3 outputs, each comprising a combination of the 3 symbols input into each of the interleavers.) wherein each of the input symbols is taken from a signaling constellation (symbols are inherently taken from signaling constellations).

It would have been obvious to a person of ordinary skill in the art to provide an identical data stream to each of the interleavers, i.e. to have series 102_1 be exactly the same as data series 102_2 and 102_3 because this provides redundancy and would save time that would have been lost in retransmission of data which was received corrupted at the receiver.

Thus, Friedman discloses all the limitations claimed, but fails to explicitly disclose whether each of the output symbols may be associated with a different channel.

However, in the same field of invention, Fukumasa shows a system (Fig.13) with a plurality of interleavers, wherein

- each output symbol is associated with a respective one of plurality of different channels (Column 11, lines 20-35); and
- second logic (Fig. 13, units 104, 75_1 and 76_1) configured to transmit each output symbol (i.e. outputs of interleavers 86_1 - 86_3), on one of the plurality of different channels, to a receiver (Column 11, lines 20-35).

Thus, it would have been obvious to a person of ordinary skill in the art to transmit each of the output symbols on a different channel as disclosed by Fukumasa because it would provide further protection against frequency or channel selective interference to the redundant data being interleaved by Friedman.

3b. Regarding claims 2, 11 and 17, Friedman and Fukumasa disclose all the limitations claimed.

Friedman also shows the system, further comprising:

- third logic (Fig. 1, receiver 112) configured to receive a transmitted signal, wherein the transmitted signal includes each output symbol (Column 1, lines 26-38);
- and fourth logic configured to combine output symbols in order to recover the time series of N input symbols (Column 1, lines 26-38, wherein receiver 112 outputs combined output symbols to recover original data time series with N input symbols).

3c. Regarding claims 3 and 18, Friedman and Fukumasa disclose all the limitations claimed.

Friedman also shows system, wherein:

each output symbol in the block appears simultaneously as an output of the first logic (Column 1, lines 26-38. Since interleavers 104_1 - 104_3 receive data streams in parallel, thereby outputting each of the output symbols simultaneously).

3d. Regarding claims 5 and 20, Friedman and Fukumasa disclose all the limitations claimed.

Fukumasa also discloses system wherein:

the second logic transmits all output symbols simultaneously (Column 11, lines 20-35, wherein adder 104 combines all output symbols and transmits them together, i.e. simultaneously on antenna 76_1).

Thus, it would have been obvious to a person of ordinary skill in the art to transmit each of the output symbols on a different channel as disclosed by Fukumasa because it would provide further protection against frequency or channel selective interference to the redundant data being interleaved by Friedman.

3e. Regarding claim 9, Friedman and Fukumasa disclose all the limitations claimed.

Friedman further shows receiver for block encoded data comprising a fifth logic configured to de-interleaver to produce de-interleaved reference symbols (Fig. 1, deinterleavers 116_1 - 116_3 together are equivalent to claimed fifth logic).

4. Claims 4, 6 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Friedman in view of Fukumasa as applied to claims 1 and 16 above and further in view of previously cited Hulyalkar et al. (US 5291298), hereinafter, Hulyalkar.

4a. Regarding claims 4 and 19, Friedman and Fukumasa disclose all the limitations claimed, but fails to explicitly mention whether each output symbol contains a weighted sample of all of the input symbols.

However, in the same field of endeavor, Hulyalkar shows method and apparatus for transmitting multi-carrier signals wherein each output symbol contains a weighted sample of all of the input symbols (Figs. 4 and column 5, lines 45-65).

Thus, it would have been obvious to a person of ordinary skill in the art to use Hulyalkar's method of transmitting weighted multi-carrier symbols because Hulyalkar's method provides greater immunity to noise and interference by distributing the signal among the several carriers which are distributed uniformly throughout the allocated frequency band (Column 2, lines 60-64).

4b. Regarding claim 6, Friedman and Fukumasa disclose all the limitations claimed, but fails to explicitly mention whether each output symbol contains logic to scale each of the input symbols by a scale factor.

However, in the same field of endeavor, Hulyalkar shows method and apparatus for transmitting multi-carrier signals wherein whether each output symbol contains logic to scale each of the input symbols by a scale factor. (Figs. 4 and column 5, lines 45-65, wherein weighting is equivalent to claimed scaling and weighting coefficient is claimed scale factor).

Thus, it would have been obvious to a person of ordinary skill in the art to use Hulyalkar's method of transmitting scaled multi-carrier symbols because Hulyalkar's method provides greater immunity to noise and interference by distributing the signal among the several carriers which are distributed uniformly throughout the allocated frequency band (Column 2, lines 60-64).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friedman in view of Friedman in view of Fukumasa as applied to claims 1 and 16 above and further in view of previously cited Rakib (US 5805583), hereinafter, Rakib.

5a. Regarding claim 7, Friedman and Fukumasa disclose all the limitations claimed, but fails to explicitly mention whether noise energy present in each of the time series of N input symbols is spread among at least one of the received output symbols such that the noise energy is reduced.

However, in the same field of endeavor, Rakib shows system for transmitting data over multiple channels wherein noise energy present in each of the time series of input symbols is spread among at least one of the N outputs such that the noise energy is reduced (Column 4, lines 34-59).

Thus, it would have been obvious to a person of ordinary skill in the art to use Rakib's method of transmitting data by spreading the noise energy because it achieves high noise immunity (Column 4, lines 34-59).

Allowable Subject Matter

6. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is an examiner's statement of reasons for allowance:

6a. Regarding claim 21, prior art of record fails to show sixth logic configured to re-interleave the block of N de-interleaved reference symbols to produce a block of N interleaved reference symbols; seventh logic configured to update a decision feedback equalizer with each of the N interleaved reference symbols, In combination with each and every other combination of the claim and its base claim.

7. Claims 12, 13 and 15 are allowed.

The following is an examiner's statement of reasons for allowance:

7a. Regarding claim 12, prior art of record fails to show a communication system comprising: means for combining a time series of N input symbols into a block of output symbols, wherein N is greater than one, wherein the block comprises N output symbols, wherein each of the output symbols comprises a combination of the N input symbols, where each of the input symbols is taken from a signaling constellation, and wherein each output symbol is associated with a respective one of a plurality of different channels, in combination with each and every other limitation of the claim. Claim language invokes 35 U.S.C. 112, sixth paragraph and hence has been construed to cover the corresponding structure described in the specification and equivalents thereof. Specifically, the "means for combining" is interpreted to be commutator switch 305 and space diversified linear block interleaver (SDLBI) 310 of Fig. 3, wherein the interleaver performs claimed combining using the structures disclosed in Figs. 4 and 5 as described in paragraphs [037] – [048] on pages 7-9 of the specification.

7b. Claims 13 and 15 are allowed as being dependent on claim 12.

7c. Claim 14 would be allowable as being dependent on claim 12 if the 35 U.S.C. 112, second paragraph rejection above is overcome.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vineeta S. Panwalkar whose telephone number is 571-272-8561. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/V. S. P./

Examiner, Art Unit 2611

/Mohammad H Ghayour/

Supervisory Patent Examiner, Art Unit 2611